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'Listening to myself': improving oracy and literacy among children who fall behind

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There is now a renewed emphasis in the UK on short intensive interventions to tackle reading failure. In this paper we report on the effect of a programme based on a view that reading problems are associated with the inability of the learner to deal with speech at the level of individual speech sounds even though they may be fully competent in the production and perception of oral language. We investigated the effect of a self-voice feedback intervention programme on the word recognition abilities of pupils who were experiencing reading delay. Our sample was made up of 159 pupils aged 6–13 years, whose reading age was at least one year behind their chronological age, drawn from seven schools in England. We used a quasi-experimental pre-test/post-test design with experimental and control groups using between-subjects (randomly assigned) and within-subjects (those waiting-in-line as controls before entering an intervention group) analysis. We found that those in the intervention condition made significantly greater gains in their word recognition abilities than their counterparts in control conditions or than they themselves had made prior to entering the intervention condition. We concluded that whilst the success of the programme suggests that pupils who display reading delay problems can have their word recognition abilities improved by an intense self-voice feedback intervention, at least in the short term, further work is necessary to investigate how the intervention works procedurally and the longevity of its effect.

Keywords: *Reading delay; Quasi-experimental design; Intervention; Self-voice; Self-as-model; Teacher assistants*

The controversies over which is the best way to teach beginning and delayed readers have, unfortunately, on occasions, produced more heat than light (Stanovich, 1990; Smith, 1994). As a result, theories of how reading should be best taught have not always been tested through the mechanisms of rigorous scientific empirical enquiry or rationale debate. Many individuals have ended their school days with a reading

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level that prohibits, or makes difficult, full access to all that contemporary society has to offer in economic, cultural and other areas of personal development. This is a problem not only for the individual, but for society at large. It has become a major issue for governments of advanced nations, and one that causes them to seek ways to improve the literacy standards of their populations. For example, Adams (1990), Snow *et al.* (1996) and the National Reading Panel (2000) were all reports funded by the US Federal Government, and the Bullock Report (1975) and the research that underpinned the National Literacy Strategy (DfEE, 1998) and Rose Report (2005) were funded by the UK government

Children, and particularly those who have fallen behind their peers in reading, cannot be left to their own devices. Intervention of one sort or another is essential. The paper reports on the effects of an intervention programme that has been designed to help delayed readers. The programme attempts to tap into a deficiency associated with learners being unable to deal with the association between speech at the level of individual sounds within words and their visual representations on a page of text. Many learners who display this deficiency when it comes to reading texts (written speech) are often fully competent in the production and perception of oral language. The central ingredient of the self-voice programme reported here is to enable children to hear the sound components of their own voice as it is normally heard by others but not themselves. This was made possible by using a Coomber 3902 tape recorder. This recorder is used extensively by those learning a new language as it allows learners to hear their own voice as they speak, so that they can modify their accent. The learner wears headphones that allow the voice as they speak to play directly to their ears at a volume above their bone voice, thus suppressing it. In this way, the learner is able to hear themselves speak, as it were, from the 'outside' (acoustically) rather than the 'inside'.

To clarify, our articulatory properties refer to the way in which we form our speech into distinct sounds, syllables or words using our vocal chords. In the normal course of events, we receive (hear) the sounds of our own speech through the bones in our head, whereas, we receive (hear) other people's speech acoustically. Their voices are transmitted to us through the air. As we receive our own speech not in reference to its acoustic properties as we do other people's speech, but in reference to its articulatory properties, we do not normally hear ourselves as others hear us. The main advantage of the Coomber 3902 is that allows learners to hear themselves speak as others would hear them, while speaking. In the case of foreign language teaching this is an important facility as it gives the learner a mechanism whereby they receive immediate feedback on their articulations (pronunciations). In effect, the Coomber 3902 acts as a mechanistic 'accent modifier'.

We had used this equipment in exploratory trials in the UK and North America with delayed readers to see if the 'self-voice feedback loop' used by second language learners would facilitate phonic awareness. We hypothesized that it would increase learners' awareness of the association between the visual squiggles that make up words and the sounds they make. We found that the delayed readers on which we trialled this device all developed a greater awareness of the sound to the sub-word

components of written language. This led to an increased awareness of how to integrate sounds (phonemes) with letters (graphemic representations). We also noted that, once equipped with these enhanced sensitivities, our delayed readers were more able to read words when tested using before-and-after standarized tests after a relatively short intensive intervention period. There was also a suggestion that speech dysfluent children in our clinical trails were showing marked improvements in their oracy in terms of clarity of pronunciation and fluency.

Encouraged by these early findings, we set about investigating the effectiveness of the intervention in a range of classroom and school settings. We were interested in the extent to which the self-voice intervention would produce measurable improvements using word recognition tests. We were particularly interested in whether the self-voice intervention would work within normal classrooms and schools without undue upheaval and within normal budget constraints. This chapter reports on what we found when we transferred it into normal classrooms. First, we briefly review the theoretical principles that underpin the programme.

Reading development and reading delay

Reading delay may well have many causes, including the neurological and the genetic. Perhaps sometime in the future new neurological and genetic remedies will be constructed. Until such time, from a teacher's perspective, the answer to reading delay lies in developing teaching methods and curricula that are generally effective in promoting reading development. Teachers are thus reliant for their remedies on using theoretical developments and evidence-based practices.

The current theoretical consensus concerning reading development and reading delay makes direct links between oracy and literacy. Writing is written speech. At its simplest level, when we write in English, we use a code and a set of rules, so that the reader can re-create the original speech. Although we speak in syllables, the writing code in English, at least, is based on phonemes. In order to read written speech, the reader needs to make an association between the visual symbol on the page (e.g. 't') and the phoneme or sound that it makes ('t'). Readers have to work out how the squiggles on the page relate to the sounds that they know from speaking and listening. For example, the reader needs to know that 'cat' has three separate phoneme sounds '/k/ … /ae/ … /t/' which are represented by the letters c, a and t. This is what is known as phonological awareness in the reading literature. Phonological awareness is considered to be central to being able to read successfully (e.g. Adams, 1990; Swan & Goswami, 1997).

Phonological awareness training is now an established part of the reading curriculum in the UK (DfEE, 1998; DfES, 2006). It is about raising the learner's awareness of the sound structure of language. The learner is asked to listen to a spoken word and perform the required segmentation, such as 'cat', '/k/ … /ae/ … /t/', and so on. Through activities such as this, the learner is being helped to develop their knowledge of the correspondence between letters and their pronunciations, such as between speech sound 'ch' and what the letters 'ch' look like when written.

Although phonological awareness is now accepted as a necessary condition of success in reading, it is not considered to be a sufficient condition. Bus and Van Ijzendoorn (1999) came to this conclusion after conducting a meta-analysis of 52 phonological awareness training studies. They evidenced that the development of letter recognition and orthographic (alphabetic) coding skills were also important. Although Bus and Van Ijzondoorn's work concerned the beginning stages of reading, it is reasonable to extrapolate from their findings to argue that this also applies to interventions with delayed readers. Besides, there is evidence that delayed readers not only experience difficulty acquiring grapheme-to-phoneme (letter to sound) correspondence rules, they also have difficulty deciphering the alphabetic (sound to letter) code (Byrne & Fielding-Barnsley, 1989).

Thus, training in phonics, which is the reverse of phonological awareness training, is also now an established part of the reading curriculum in the UK (DfES, 2005, 2006). This is about training learners in the application of knowledge of grapheme-to-phoneme (letter to sound) correspondence rules. For example, when a reader sees the written from 'ch', they have to work out it how it sounds when spoken. Thus, while phonological awareness training is about working from sound to text, training in phonics is working from text to sound. Both types of training are essential in the learning to read process and are in complementary relationship with one another (see for a comprehensive review of this area Adams, 1990).

If a learner's visual coding is inadequate, then it will be more difficult for them to learn the association between, for example, the consistent visual symbol 'ch' and the phoneme or sound they know from speech '/ch/'. Likewise, if their auditory coding is inadequate, then it will be more difficult for them to learn the reverse association, that is mapping the sub-word sounds from speech to their visual counterparts. This means that it is essential for teachers to tap into the mechanisms associated with early visual coding of letters within words and early auditory coding of the sub-word components of spoken language (e.g. Ehri *et al.*, 2001; DfES, 2005).

When addressing the problem of delayed readers, the question arises as to why some learners appear to be less sensitive to the configuration of internal components (or symbol strings) of words. In the reading literature this is generally put down to complications arising from the co-articulation process of speech (e.g. Bradley & Bryant, 1985; Liberman, 1985, 1997; Goswami & Bryant, 1990). The argument goes that, because we speak in syllables not phonemes, some learners experience problems separating syllables into their constituent phonemes (sounds). This is because when we speak, each constituent sound is affected by those that follow. This happens because when our speech production mechanism is producing the first sound in a word, it is getting ready to produce the second, and so on. This makes it difficult for the listener to recover single phonemes from a stream of speech, which, in turn, makes it difficult for some learners to rapidly and securely acquire phoneme/grapheme correspondences. These learners have difficulty in developing their ability to separate out (segment) phoneme sounds that make up words or syllables within words, so that they can match these against their visual counterparts. Since word recognition is conditional on the successful segregation

and integration of the components (letters) that make up words, the result is poorly developed word recognition skills.

There is now general agreement in the reading literature that it is this mismatch between the formation of the sound and the sound itself that makes it difficult for some children to acquire reading attainment adequate to their needs. There is also a consensus that this deficiency can be ameliorated by explicit phonic awareness instruction complemented by phonological awareness training (e.g. Snowling, 1996; Tunmer & Chapman, 1998; Stainthorp & Tomlinson, 2002).

The self-voice intervention

As indicated earlier, an important feature of the recording equipment that we used in our exploratory trials was that when the learner was making a taped lesson, the voice they heard was their own, but coming to them via the air from the outside rather than via the bone from the inside. The learner, as it were, was thus able to hear themselves as they speak from the outside in. A second important feature on the Coomber 3902 from the teacher's point of view, was the 'joggle' facility on the rewind control. This is a facility that was originally developed for studio recording purposes as it controls the amount of tape that can be rewound per button press. This made it easier to edit out mistakes.

In our early trials we used this facility to edit out reading mistakes 'on the fly' (contemporaneously with the recording). This meant we could edit out mistakes as we went along, rather than after the recording had been completed. We found this approach had several advantages. It was economical with time and required less effort from the learner and the teacher. It was also more in keeping with normal teaching practices and routines to correct errors as the lesson progressed rather than when it had finished. We therefore adopted this approach in the classroom situation.

The teaching materials were not constructed specially for the intervention. Their earlier development had been based on the theoretical ideas underpinning reading development and reading delay reviewed in the previous section. To recap, the materials were derived from the theoretical notion that speech is coded to print through the phoneme device and the addition of a set of orthographic rules that deal with levels of organization beyond basic letter/sound correspondences or phonics. Singly there are 26 letter sounds in the English alphabet but these combine to give 43 or 44 different sounds or phonemes.[1] English is a syllable-stressed language. This means that when a different stress is laid on a syllable in a multi-syllabic word, the meaning of the word can alter, for example, con*tract* (to shorten) and *con*tract (an agreement).

The teaching materials were designed in such a way that, when a tape was being made, both analytic and synthetic phonics were being used. Analytic phonics involves the segmenting of words. Every word is seen, said and segmented. Synthetic phonics involves synthesis or pronouncing segmented words as full words. These full words were then read within the context of a sentence. Finally, the full sentence in which the target word appears in context had to be written out.

Implementing the programme within schools

Given the current restrictions on teaching oracy and literacy in English state schools imposed by government policy, we were particularly interested in exploring whether our programme could be transferred into ordinary classrooms at this time. Since 1998, the teaching of reading in state school classrooms in England is set entirely within the National Literacy Framework (DfEE, 1998), and now contained within the Primary National Strategy (DfES, 2006) for literacy teaching. As well as setting out teaching objectives for the whole of the primary school (key stages 1 and 2) to enable pupils to become fully literate, the framework gives guidance on how and when this teaching is to take place. It is highly prescriptive in terms of day-to-day literacy teaching. The daily routine involves an hour of literacy teaching, broken down into a 15-minute-whole class teaching session followed by a 15-minute whole-class activity. This is then followed by 15–20 minutes of group work, culminating in a 10-minute plenary.

An additional literacy support element within the framework of the literacy hour is designed to help pupils aged 7–11 years (key stage 2) who have failed to keep up with their peers in reading and other related literacy skills and competencies. These are the pupils who would not otherwise receive extra support in this area. The additional practice work, designed specifically for these pupils, is administered during the allocated 15–20 minutes; group work in one-to-one or small-group sessions. The bulk of this work is taught by non-qualified teachers, under the guidance of qualified teachers. It was these teaching assistants who we trained to deliver our programme.

We considered training essential to ensure intervention integrity as well as consistency across tutors and schools. All the training was carried out by an educational psychologist, one of the authors (P.M.) and who was already known to all participating schools. Although the training took place in individual schools at different points in time, the format and content of the sessions were always the same. They involved 15 hours spread over three consecutive days, one half-day session followed by two full-day sessions. The first half-day session provided an introduction to the programme including the theoretical principles on which it was based. During the following two days, the teaching strategy was explained and modelled. Demonstrations, role play and hands-on workshops were used to enable the trainees to practise on each other and on pupils who were not part of the study. Training materials were designed to take the trainees back to their own learning-to-read experiences. Special emphasis was put on the fostering of letter-to-sound and sound-to-letter links. These activities helped to engender a supportive learning atmosphere.

After training, each participating pupil received 20 sessions of input made up of two sessions a week for 10 weeks. Each training session took place during the 15–20 minute group work allocated time within the literacy hour. These were one-to-one sessions with a teaching assistant where the task was to help the pupils make a tape recording of themselves reading a list of words. The teaching assistant then edited the tape to make it error free before it was given to the pupil to practice on. A fresh tape was made at each of these twice-weekly, one-to-one sessions using progressively more difficult words. In between tape-making sessions the pupils had five 15-minute

sessions where they required to practice independently using the tape that had been made at the preceding tape-making session. In these practice sessions the pupils read a list of words while simultaneously listening to the words being spoken by themselves. At the end of each practice session, the pupils were required to read the list of words without the tape and to correct themselves if they made a mistake.

The pupil participants

A total of 159 pupils aged between 6 and 13 years took part. They were drawn from across seven schools and had a reading age that was at least one year behind their chronological age. The seven participating schools were made up of five state primary schools, one private primary (preparatory) school and one state secondary school. All were located in the south-west of England. The scores of pupils who missed three or more teaching sessions were eliminated from the analysis.

Measuring the effectiveness of the programme

We were interested in exploring whether the programme produced measurable gains in the pupils' reading recognition abilities compared to other pupils not receiving the programme and compared to the participating pupils own reading recognition gains before they began the programme. We used a pre- and post-test quasi-experimental design over three data collection phases. In phase 1 we compared the self-voice intervention with a control group who followed their normal classroom routine.

Two-word recognition tests were used for pre- and post-testing, the *Boder test of reading–spelling patterns* (Boder & Jarrico, 1982) and the *Neale analysis of reading* (3rd edn) (Neale, 1999). All pre- and post-testing was done by the teaching assistants and took place during the week immediately before the programme began, and during the week immediately after the programme had finished. The whole programme, including pre- and post-testing, took place over a 12-week period.

In the initial phase we found that the self-voice group made greater gains, on average, between pre- and post-testing than the normal classroom routine group. The 22 pupils in the self-voice group gained, on average, 1.56 months (standard deviation = 0.66) compared to the 22 pupils in the normal classroom routine group who had a mean gain of 0.37 months (standard deviation = 0.35). This difference was statistically significant ($t = 7.6$, $df = 43$, $p = 0.0001$).

Encouraged by this outcome, in the next phase we introduced a further control group which was similar to the self-voice, in many respects, but had another person's voice on the tape. We thus compared the reading gains made over the 10-week intervention period of pupils who had received the 'self-voice' intervention with pupils who had received 'another-voice' intervention and with pupils who had followed their 'normal classroom routine'. The purpose of the 'other-voice' intervention was to introduce a more carefully matched comparison condition to avoid Hawthorne effects which are known to inflate experimental results because of the special attention being paid to participants. The 'other voice' group followed a similar routine to the self-voice

group and practised on the same word lists. They did not, however, make a tape of their own voice reading these words and practised instead by listening to a tape of the words being read by another person's voice. The voice on the tape saying the words on their list was that of an adult female who was not known to them.

We found that, in this second data collection phase, the 37 pupils in the self-voice group gained more, on average, than the 36 pupils in the 'other-voice' group and than the 35 pupils in the normal classroom routine group. The self-voice group gained, on average, 1.1 months (standard deviation = 0.42) compared to 0.34 months (standard deviation = 0.22) in the normal classroom routine group and 0.42 (standard deviation = 0.42). Again, these differences were found to be statistically significant ($F = 43.9$, $df = 107$, $p = 0.001$).

In the third and final data collection phase, we compared the scores of the 59 pupils who were waiting in line, in the normal classroom routine conditions, in both phases 1 ($n = 22$) and 2 ($n = 37$) with their scores after taking part in the self-voice intervention. We found that they made greater gains in the self-voice condition than they did when they were waiting in line in the normal classroom routine condition. In the self-voice condition, they gained, on average, 1.25 months (standard deviation = 0.57) compared to 0.35 months (standard deviation = 0.27) when they followed their normal classroom routine over a similar period. This difference was found to be statistically significant ($t = 10.96$, $df = 116$, $p = 0.001$).

We thus found that, at all group-level comparisons, pupils who were given the self-voice intervention programme made greater gains than those who were not given it. We also found that the same pupils made greater gains when they were participating in the self-voice intervention than when they were following their normal classroom routine in a similar period immediately prior to the self-voice intervention.

Closer scrutiny of these results showed that the standard deviations for those in the self-voice condition were higher across the board than for those in the comparison groups. This meant that there was a greater spread of gains within that self-voice group compared to other groups. This suggested that relying on group-level comparison only may be misleading. To counteract this possibility and to get a greater insight into how and when the intervention worked or did not work, group-level comparisons were supplemented by sub-group comparisons and individual-level comparisons. We surmised that consistency in findings across contexts and within-pupil differences would be useful in drawing conclusions about the generalizability of the self-voice intervention.

Our sub-group comparisons involved compared gains made by girls and boys. We also looked at how pupils from different schools performed relative to one another: we compared younger pupils' gains with those of older pupils; we considered whether initial reading age, relative to chronological age, made a difference. In these subgroup comparisons we found that, although girls gained slightly more than boys in all three data collection phases, these differences never reached statistical significance. While we found that pupils with higher initial reading ages gained more than those with lower initial reading ages, when initial reading age relative to chronological age was taken into account, these difference disappeared. There was, however, some evidence

that older pupils benefited more from the self-voice intervention than younger pupils. Their teachers put this down to more mature pupils being better equipped to cope with the self-voice intervention because it demanded an ability to work independently. There was also some suggestion that pupils attending one state primary school made greater gains than those attending the six other schools in our sample. None of these sub-group level comparisons, however, reached statistical significance.

We then compared individual learners by identifying outliers, that is those who gained the most or gained the least from the self-voice intervention. We found that the typical pupil who gained the most from the intervention was female, older (10+) with an initial reading age of just over one year behind their chronological age. On the other hand, the typical pupils who gained the least from the self-voice intervention were male, younger (7–8) and most likely to be pupils at the only non-state school in our sample. These findings concurred with the findings from our sub-group comparisons.

Discussion

Mean gain scores showed that those pupils who participated in the self-voice intervention did indeed make greater gains in their ability to recognize words than those in similar groups who did not experience this intervention, or they themselves when similar periods of teaching and practice were compared.

But to what extent can we generalize from these results? As we found no significant interactions between the effects of the self-voice intervention and a number of contextual and individual variables, our results support the contention that the intervention effect can be generalized across a range of schools, teachers and girls and boys of different chronological and reading ages when used to support readers who have fallen behind. While the evidence presented here does not extend to children whose reading ages are the same as or above their chronological ages, theoretically we would argue that the same effect, that is the acceleration of word recognition, would have been obtained by any group in the initial stage of learning to read. Extrapolating from our findings, it is reasonable to argue that, used as a preventative measure for those who do not spontaneously discover the connection between graphemes and phonemes, the self-voice could explicitly teach this connection. This is especially important given that prevention interventions have been found to be more effective than remedial interventions (Ehri *et al.*, 2001).

The effects reported in this chapter were attained at the immediate end of the intervention programme and investigations as to the longevity of this effect are ongoing. However, in considering the longer-term value of the intervention programme for those who received it, a key question is whether the improvements noted at word-level oral reading leads on to mastery and use of both metacognitive (self-monitoring, self-regulation) and cognitive (rereading, activating background knowledge, adjusting reading speed) strategies that facilitate text comprehension. The question of transferability to everyday reading tasks within and beyond the classroom is an important one which leads on to the issue of whether the theoretical rationale for the self-voice intervention has been upheld by our findings.

On theoretical grounds, our explanation for stronger word recognition performance of the self-voice condition relative to the other-voice and the normal classroom routine condition was that those in the self-voice feedback group were better equipped to make a direct link between the pronunciation of words and the visual (letter) cues on the page. This was because they could hear their own voice saying the words as they spoke them on to the tape, and on which they later practised. We interpreted these results as revealing that hearing their own articulated voice (as opposed to the bone voice they normally hear) helped them to understand the internal structure of spoken words. This, in turn, gave them a better understanding of the alphabetic code that underpins words written down. Before the learner can read, they must be able to figure out the graphic symbols on the pages and map them on to their auditory counterparts. The tape, we would argue, provided pupils with a direct and immediate means of connecting words (letter strings) on the page to their pronunciations.

In addressing the question of the extent to which the positive results reported in this paper validate the theoretical principles underpinning the programme, the strongest evidence comes from the phase 2 data, which had a carefully matched control on all aspects except the voice on the tape used to practice on between the twice-weekly tape-making sessions. While there are plausible grounds for optimism about the effectiveness of the programme, it is less clear whether the positive results were due to the theoretical basis of the intervention or some other factor, or set of factors.

During the making of the tape, there were numerous opportunities for metacognitive exchanges and modelling on a one-to-one basis with a specially trained and experienced classroom assistant. The tape also provided opportunities to practise independently. Both the self-voice and the other-voice groups had their work regularly (twice-weekly) monitored and, no doubt, in these sessions feedback was offered. Both the self-voice and the other-voice conditions may have gone some way to fostering the learner's agency over their own learning, including responsibility for their own learning. So, then, we must ask why was listening to one's own voice a more powerful learning experience? It is possible that listening to one's own voice helped learners see how letter sounds fit into words and encouraged them to explicitly consider word sounds. This, in turn, should make them better able to isolate phonemes within words.

However, another equally plausible explanation for the results comes from the self-as-model hypothesis. This hypothesis derives from a body of literature within psychology that indicates that using oneself as a model can be an effective means of ameliorating academic failure (see for a review Hitchcock *et al.*, 2003). Generally, self-as-model refers to the observation of images of oneself engaged in the behaviour one is seeking to modify. Images can be high tech, low tech or no tech. They can be video tapes, audio tapes, still photographs or an imaged visualization. According to Vygotsky (1978), observing or listening to a superior performance would indicate future mastery as a transformation, facilitated through the guidance of a more skilled person, takes place within the zone of proximal development. But what if that more skilled person is a view of one's own (future) mastery? Would not the image be more powerful? There is some evidence to suggest that the self is the ideal model because

it maximizes the degree of observer identification (e.g. Clark *et al.*, 1992). An important aspect of the self-voice intervention was the editing out of mistakes so that the practice tape provided a perfectly mastered self-model of reading behaviour. Not only would the audio tape have provided a flawless model of (future) mastery, but a model of oneself performing successfully. From a social learning theoretical perspective, it is reasonable to argue that this would strengthen their belief in their own capacity to become a successful reader (Bandura, 1997). Self-awareness through self-observation may have an important role in facilitating other metacognitive factors, such as self-belief and self-efficacy among children, and particularly those who fall behind their peers.

Conclusion

Although the delayed readers who were in the self-voice intervention groups in our study made greater grains in their word recognition scores than those in the other-voice and normal classroom routine groups, caution is needed in jumping to the conclusion that this is the sole result of the intervention. Although this may be the case, we must also consider the possibility that factors other than the theoretical assumed processes might have influenced the outcome. Further comparative evaluations are therefore necessary to examine how the intervention works procedurally, and how we can map these operations theoretically. This will involve a programme of research focusing on different ways of setting up the intervention. For example, the nature of the link between what is being learned in the self-voice condition as opposed to the other-voice condition should be explored in further intervention research.

Note

1. The difference in phoneme numbers, 43 or 44, is due to differences in how the 'wh' phoneme is pronounced. Some pronounce it as 'wh' by aspirating before voicing, and others as 'w', which makes a different sound.

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